

# Surface Matters

*What Arizonans are doing with geospatial technology*



Newsletter of the Arizona Geographic Information Council

## Greetings from the President

**Tim Smothers**

*AGIC President*

Welcome fellow geo-spatialists to the first issue of the newly revived newsletter of the Arizona Geographic Information Council (AGIC). For those who've been with us over the past decade, you'll remember past efforts to inform and enlighten the geographically inclined to the happenings of our ever-growing community. For you multitudes of newcomers, welcome and enjoy the read.

As current AGIC President, I wish to extend a big thank-you to our volunteers for their enthusiasm toward this new effort to inform, educate, and rally all of Arizona's geospatial professionals. This enthusiasm is personified within the Conference, Education, and Outreach Committee of AGIC (yes, this is one group wearing many hats), who have made this publication possible. I would also be remiss not to thank all the executive board and committee members for their (volunteer) work within AGIC, and lastly my greatest appreciation to the staff of both the State Cartographer's Office and the Arizona State Land Department for their efforts to keep this ship afloat and on course.

Efforts of the past year have greatly expanded the width and breath of AGIC's activities. A primary achievement was the compilation of the Mapping Arizona document (check it out on [agic.az.gov](http://agic.az.gov)) which in addition to outlining tasks pertinent to the

executive board, also showcases a variety of outstanding GIS applications developed throughout our great state. Using Mapping Arizona as a guide, AGIC has the opportunity to provide the executive board, committees and other members of the geospatial community with a living document defining our goals and objectives.

As I review the document, a common theme is prevalent: working toward the 'enterprise.' Bringing GIS out of the basement and putting it on the common desktop is a paramount goal of AGIC;

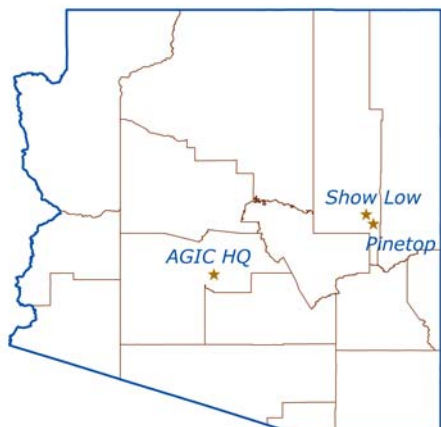
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## GIS Education in Arizona: An Introduction

GIS (Geographic Information Systems or Geographic Information Science, take your pick) has firmly established itself as a concept, a technology, a set of procedures, a discipline, a profession. It is growing rapidly across the globe as people find countless ways to apply it. With growing demand for a technology comes a continued demand for classes in which to learn it.

Where can one go in Arizona to learn GIS? Many venues are available throughout the state. The three state universities have established curricula in the field, plus on-campus job opportunities and off-campus internships. Community colleges in several counties offer GIS courses, including GIS certificates. Technical schools are also in on the act. Not to be

*continued on page 2*



### INSIDE THIS ISSUE

3	Spatial integration at the City of Show Low
4	Pinetop's high-tech emergency response
5	AGIC roundup
6	GIS teacher seminar, Calendar of events

## President's Greetings

*continued from page 1*

in time, using GIS should be as common as using word processing software. AGIC will be looking to set priorities and standards for data, making this information efficient for a variety of operations. In addition, AGIC will be looking to secure necessary data resources for use in various enterprise (statewide) applications. We will also work to develop the means to build better data through efforts like the Arizona Height Modernization program (adding geodetic control to the existing Public Land Survey System), thereby strengthening Arizona's framework datasets.

Another goal, which will be a key ingredient to the success of many AGIC initiatives, is the development of a 'statewide enterprise GIS.' This will require identifying the appropriate means to deliver information statewide via proven technologies, while working to develop web-based tools that will allow users the ability to view, manipulate, and analyze information through a single source. Lastly, we will work toward getting this information to the folks who need it, educating them and the public, and reaching out to others having an interest in geography and in the information contained by our inventory of points, lines, and polygons.

Wow, talk about some lofty goals, but in essence all necessary to build the common enterprise one step at a time. This newsletter will be one of the conduits to deliver the message, information, and ideas coordinated through the various AGIC committees to our customer, YOU. So grab a beverage of choice, sit back and enjoy the revitalized AGIC newsletter. ♦

## GIS Education

*continued from page 1*

outdone, some high schools offer GIS instruction, while in other cases GIS professionals bring the technology to junior high and primary school students. Meanwhile, at the professional level, those who already work in the field can increase their skills through classes that are available from software companies or through private contractors who specialize in GIS training.

In coming issues of *Surface Matters* we will explore GIS education in greater detail. Which schools have classes? What do GIS certificates entail? Where can internships be found? Questions such as these will be pursued as we crisscross Arizona to find out where people can go to learn GIS.

If you can't wait for future issues (this is only a quarterly publication, after all), here is a unique web page you may find useful:

Arizona GIS Educators

<http://agic.az.gov/directories/ed.htm>

This list contains links to web sites of private companies, colleges, and government offices that offer GIS classes. The entries include people to contact, phone numbers, the types of courses offered, and the levels of training available. Each entry is dated to show when it was last updated.

Opportunities for GIS education in Arizona are numerous, varied, and growing. *Surface Matters* will search them out and bring them forward as a regular feature in each issue. ♦

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***Surface Matters*** is the quarterly newsletter of the Arizona Geographic Information Council. It is written for those who want to stay in touch with the vision and activities of AGIC and with the continuing growth of GIS in Arizona.

Your comments about this publication are always welcome. Please send all correspondence to the editor.

Readers are invited to submit articles that they wish to be considered for publication. The author retains all copyrights. Please let the editor know if the article has been published elsewhere.

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Mention of private companies in this newsletter is for information only and does not imply endorsement by AGIC or the State of Arizona.

# Show Low's Spatially Integrated Storm Water Master Plan

**Jeff Cook**

*GIS Coordinator, City of Show Low*

How does a small city in the mountains deal with all of the runoff that comes from storms, snow melt, and the changing topography caused by growth and development? If the city is Show Low, it implements a cutting-edge, multi-faceted, fully integrated storm water master plan.

A community of 10,000 people, Show Low sits in the White Mountains at the southern end of Navajo County. It receives 17 inches of precipitation each year and has its share of runoff problems. The city has experienced, and continues to experience, extensive growth in both land area and population. It covers 35 square miles and has nearly 150 miles of public and private streets. The primary drainage through the city is Show Low Creek. A master plan is needed to identify inadequacies with the current drainage facilities, to locate potential problem areas, and to serve as a guide for future development.

Until recently the approach to drainage problems was rather piecemeal. Many small-scale drainage studies were done in the past, but these only addressed specific problem areas like subdivisions or commercial developments. The master plan will identify the entire regional drainage basin and will include the city and the surrounding area.

The goals of the plan are comprehensive. Begun in November 2004, it will help guide the city's land development policies for the next 20 years. Its main objectives will cover the following points:

- Identifying regional drainage basins and sub-basins
- Identifying current and potential problem areas
- Locating facilities that need upgrading
- Recommending facility improvements
- Developing a capital improvement plan for system expansion
- Recommending policy changes in the city's land development requirements

Behind this all-encompassing plan will be three primary movers: Show Low GIS Coordinator Jeff Cook, City Engineer Bill Bess, and Public Works Director Kevin Heberle. They will coordinate their efforts to ensure that the plan meets its goals and is implemented effectively.

All of the prospective improvements will rely upon an enormous amount of data that will be collected from a wide variety of sources. Much of the data will then be used in a flow modeling program that will initially be applied to localized runoff. As data are collected over time and more experience is gained with the program, the flow model will be used to simulate more complex scenarios covering wider

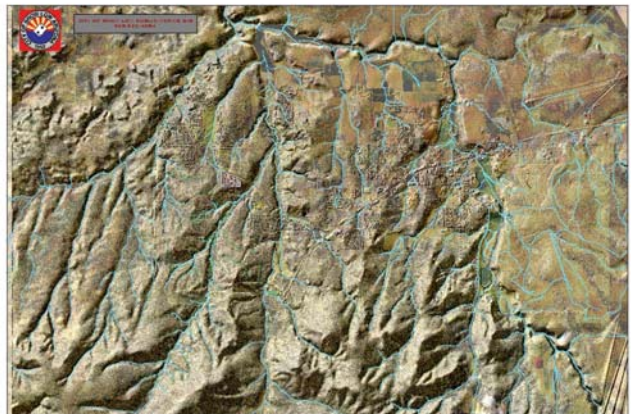
surface areas.

The information to be gathered for the master plan will include numerous geographic layers, historical rainfall and flood data, future data from rain gauges, population figures, and structural information such as slopes and cross-sections of ditches, culvert pipe diameters, and flow channel lining materials.

Many of the spatial layers to be used in the GIS will be useful for both mapping and flow modeling. Show Low currently has one-foot and two-foot contours for most of the city. For the outlying areas, ten-meter digital elevation models will be used to create less detailed contours. Other layers will include drainage basins and sub-basins, natural and manmade flow channels, soils, land cover, and vegetation.

Two- and three-dimensional maps of varying scales will be produced using ArcGIS 9 and its 3D Analyst extension. The flow modeling will be done using the HEC-1 hydrologic model, which is widely used for storm water applications. HEC-1 was developed by the U.S. Army Corps of Engineers and is capable of modeling anything from the runoff in a single neighborhood to the flow through an entire watershed several hundred square miles in area. The Show Low team will take a graduated approach, beginning with simpler models of runoff from local development areas and eventually expanding to the whole watershed, which covers approximately 160 square miles. As time goes on, the most current data will be iterated through the model so that its accuracy will be continuously improved.

Show Low's storm water master plan is a high-tech, integrated approach to a problem faced by every city. As the city grows and develops, the plan will help to ensure that many potential problems do not arise. This is only the beginning of a very large project that will provide benefits for many decades to come. ♦



Stream delineation in the Show Low area built from multiple contour levels; area shown is 40 square miles.

## Pinetop Area Gets Grant to Fight Fire with Data

Consider, if you will, the following three accounts:

1) You are a resident of Lakeside, a city in the White Mountains. You have decided to build a house at the edge of town where civilization meets the woods. Concerned about the prospect of a forest fire destroying your new home, you log on to the Internet to find maps and information about development plans in your city that will help minimize the fire danger. You learn how to incorporate "fire wise" landscaping principles into your building plan.

2) You are a firefighter in Pinetop. You are called to an emergency at a business that stores dangerous chemicals. In your vehicle is a GPS-enabled laptop computer with remote access to a mass of geographic data. While en route you track your position in relation to your destination, and you retrieve a pre-plan map showing the business you're responding to, all the roads leading to it, all the fire hydrants that are nearby, and a list of the chemicals that may be present.

3) You are a volunteer with the Show Low Fire District. A fire has just ravaged part of your city and a large area of woodland nearby. In the aftermath you look at various maps that show you where the fire burned and where it didn't. You then do an analysis of regions where fire prevention techniques were implemented and evaluate their effectiveness.

With a grant that was recently received by the Pinetop Fire District, such scenarios are in the process of becoming reality. The Pinetop, Lakeside, and Show Low fire districts are sharing a \$300,000 grant from the Federal Emergency Management Administration (FEMA) that will be used to build a geospatial infrastructure for a variety of emergency response needs. Received in January 2005, the Fire Prevention and Education grant will allow the local communities to buy equipment, collect geographic data, establish new procedures, and disseminate information. The grant was initiated by Deputy Chief Stuart Bishop of the Pinetop Fire District, who provided much of the vision for the project and who remains the primary motivational force behind it.

The Pinetop Fire District has been using geospatial technology for five years; this new grant is a continuation of that effort.

The grant is already having an impact. Twelve new laptop computers have been purchased for use in select emergency response vehicles, bringing the total number of laptops to sixteen. A 36-inch plotter, which will be used in the field, has also been purchased. The plotter has a rugged travel case and can be powered by an outlet or a generator. In development and soon to be implemented is an Internet map server that will make many types of geographic data available. In a large emergency like a forest fire, personnel in the field will be able to use a

laptop to access the data through a wireless network, produce timely maps of the affected area, and print the maps on the plotter.

Many types of data are already available, including layers that show where forest thinning has taken place, the boundaries of past forest fires, evacuation zones, land parcels, and address points. Future data to be developed will include infrastructure like fire hydrant locations, but will also incorporate less concrete things like biohazard information and epidemiological survey data. All of the data will be housed at the offices of the Pinetop Fire District.

To get a handle on smaller incidents, pre-plan maps are being made. A pre-plan map typically consists of an aerial photo of a given structure, such as a school, a shopping center, or an apartment complex, with geographic data added to it. For instance, any pre-plan map will contain street names, but it may also contain fire hydrant locations, apartment numbers, classroom outlines, locations of doors or windows, and other information that will help emergency personnel deal with the situation. With such maps available ahead of time, firefighters, police officers and others will be able to make preliminary decisions before they arrive.

Responding to emergencies, however, is only part of the plan. Of equal importance is the ability to prevent disasters in the first place. Some of the grant money will go toward forest thinning, establishing defensible space around developed areas, and keeping track of homes that have undergone fire safety treatment. If a fire does break out, authorities will later be able to look at the affected areas and analyze the effectiveness of their prevention measures.

Of course, having geographic information available over the Internet is all very nice, but it won't do much good if people don't know it's there or how to use it. To realize the potential of the new data and equipment, emergency personnel will be trained to access, understand, and use the data. In addition, home and business owners will learn through public meetings which data layers are available, how to access them and how to make use of them.

Because of the recent grant from FEMA, the communities of Pinetop-Lakeside and Show Low will have the latest spatial technology to use in their emergency response efforts. The three scenarios described at the beginning are very close to being realized, and a great many other applications will soon be commonplace. ♦

*Thanks to Jeff Cook and Stuart Bishop for contributing to this article.*





## AGIC Roundup

- The Conference Working Group has been diligently planning for AGIC 2005, which will be held October 26-28 at the Prescott Resort and Conference Center. The Working Group secured a facility for the conference last February and has moved along to planning the marketing stage of the event. This year's theme is "Collaboration: Fitting the Pieces Together." The Working Group is also soliciting posters and presenters who demonstrate examples of projects and organizations that have had success through collaborative efforts.
- The Administration and Legal Issues Committee presented to the AGIC Board (at the February meeting) an outline for the new AGIC work plan for 2005. The presentation was tailored to review each committee's potential representation in the initiatives as outlined in *Mapping Arizona*. The intent of the presentation was to allow all committees to determine some reasonable goals and objectives for the coming year, and report back to the Board in order to produce a useable work plan for 2005.
- One-meter orthographic imagery of the Lower Colorado River has been completed by the U.S. Geological Survey and delivered to the State Cartographer's Office. Contact Assistant State Cartographer Jason Howard for information about how to access these images. 602-542-4060, jhoward@land.az.gov.
- An information packet describing the Arizona Height Modernization project was sent to Arizona's Congressional delegation and to the governor's office.
- The Internet Mapping User Group held a seminar on March 3. It was well attended and enthusiastically received. The next meeting will be held in September.
- Conference Committee Chair Seth Franzman and Education Chair Shea Lemar attended the Microcomputers in Education Conference at ASU last March, where Mrs. Lemar gave a presentation. The conference had more than a dozen presenters from across the country talking about how teachers and after-school groups can incorporate GIS. The GIS sections were such a success that there will be a much larger focus on GIS at next year's conference.
- Lowell Elementary School students presented their GIS work to the Bureau of Reclamation on May 4th. The students partnered with BOR to study water issues in the state. The large audience was very impressed with both the GIS and water knowledge that the students had gained in one semester.

- A working prototype of the AGIC Data Portal has been built and is being tested. One of the issues being considered is how best to configure the system to allow the public to download data.
- Software for the Arizona component of the National Map has been installed and tested by Assistant State Cartographer Jason Howard, who is collecting data for the project.
- State Cartographer Gene Trobia was in Washington, DC in May discussing the Height Modernization project with staff members from Arizona's Congressional delegation, and meeting with the National Geospatial Programs Office regarding future directions of the project.
- The AGIC Board approved a proposal to begin producing the newsletter!

**Related documents available on the AGIC web site:** 2005 AGIC work plan presentation; January 2005 Height Modernization briefing; presentations from the Internet Mapping User Group seminar.

### URISA Forming Arizona Chapter

An Arizona chapter of the Urban and Regional Information Systems Association is now forming. URISA is an organization of state and local government personnel who use information technologies within their agencies and departments.

The first meeting of the Arizona URISA chapter will take place Monday, June 6, 5:30 – 7:00 PM at Sam's Café at the Arizona Center in Phoenix. It is anticipated that future meetings will be scheduled in different cities around the state. For further information contact Eva Reid: [urisa.az@gmail.com](mailto:urisa.az@gmail.com).

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**Tim Smothers** is the GIS Coordinator for the City of Peoria and the enthusiastic President of AGIC. [tims@peoriaaz.com](mailto:tims@peoriaaz.com)



## Calendar of Events

### **ARIZONA PROFESSIONAL LAND SURVEYORS ASSOCIATION ANNUAL CONFERENCE**

JUNE 16 – 18, 2005

PRESCOTT RESORT AND CONFERENCE CENTER

CONTACT: CHRISTA LOMBARDO

CHRISTA@AZPLS.ORG

WWW.AZPLS.ORG

### **ESRI INTERNATIONAL USER CONFERENCE**

JULY 25-29, 2005

SAN DIEGO CONVENTION CENTER

WWW.ESRI.COM/EVENTS/UC/INDEX.HTML

### **SOCIETY FOR CONSERVATION GIS ANNUAL CONFERENCE**

JULY 31 – AUGUST 2, 2005

ASILOMAR CONFERENCE GROUNDS

MONTEREY, CA

WWW.ESRI.COM/EVENTS/SCGIS/INDEX.HTML

### **AGIC QUARTERLY BOARD MEETING**

THURSDAY, AUGUST 4, 1:30 PM

ARIZONA DEPARTMENT OF ADMINISTRATION

100 N. 15<sup>TH</sup> AVE., ROOM 300, PHOENIX

HTTP://AGIC.AZ.GOV/BOARD/MEETINGS.HTM

### **AGIC 2005 GIS CONFERENCE**

OCTOBER 26-28, 2005

PRESCOTT RESORT AND CONFERENCE CENTER

CONTACT: JASON HOWARD

JHOWARD@LAND.AZ.GOV

HTTP://AGIC.AZ.GOV/AGIC2005

### **WHITE MOUNTAIN GIS USER GROUP**

MEETS THE THIRD WEEK OF EVERY MONTH IN THE PINETOP-  
LAKESIDE AREA. FOR MEETING DATES AND TIMES CONTACT

STUART BISHOP: SBISHOP@PINETOPFIRE.COM

### **NORTHERN ARIZONA GIS USER GROUP**

MEETS QUARTERLY IN SEDONA. FOR INFORMATION CONTACT

AARON SEIFERT: ASEIFERT@SWIAZ.COM

### **THE SOCIETY FOR CONSERVATION GIS**

MEETS THREE TIMES PER YEAR IN TUCSON. FOR INFORMATION

CONTACT MIKE LIST: MLIST@TNC.ORG

## June Seminar Gives Teachers Hands-on Experience

For two weeks this month the *Eyes in the Sky* program will give hands-on spatial technology experience to a select group of high school science teachers and students. This will be the second phase of an 18-month program designed to bring geospatial expertise into the classroom at the junior-high and high school levels.

*Eyes in the Sky* is an ambitious, long-term effort designed and run by three dedicated education professionals in Tempe. It is intended as an avenue of professional development for junior-high and high school science teachers, and as a form of curriculum enhancement for students. In its first phase, participating teachers take a 12-week distance learning course in which they study the principles behind GIS, GPS, and image analysis. The second phase is a two-week summer seminar in which the participants learn teaching strategies and apply them in hands-on activities with students. The third part of the program begins in the fall, when the teachers begin their lessons and assign research projects to their students. Finally, in April of next year, a Saturday showcase will bring the students out to display and explain the projects they've been working on throughout the year.

The summer session will take place at Tempe High School during the weeks of June 6-10 and 13-17. Twenty-eight teachers and fifty students will participate. The first week is exclusively for the teachers; they will be introduced to methods and strategies of getting the new concepts across to students. During the second week the students will arrive and the teachers will implement the instructional methods they just learned. Also during the second week, local professionals who use geospatial technology will give lectures and demonstrations to all of the teachers and students.

The *Eyes in the Sky* program began in the fall of 2003 and was first implemented in Tucson. Fifteen teachers took part in that initial effort. This time around, nearly twice that many will participate. It is estimated that each teacher will reach up to 150 students with the new lessons that are brought into the classroom.

This effort goes well beyond short-term educational seminars. It is a long-term strategy that will bring knowledge of geospatial technology to dozens of teachers and thousands of students. The teachers, for their part, will earn four graduate-level college credits when they finish the program.

For further information and to contact the principal investigators who designed the program, please visit this address: <http://eyesinthesky.terc.edu>. ♦

*Thanks to Carla McAuliffe for contributing to this article.*